

REMARKS

Claims 1-23 are rejected under 35 USC §102(e) as being anticipated by Ferguson et al. (US Patent No. 6,798,777).

Applicants amend claims 1, 6, 9, 13, 16, 19, 22, and 23 to improve form and to place these claims in allowable form. Applicants cancel claim 3 without prejudice or disclaimer. Claims 1, 2, and 4-23 remain pending. No new matter is added by way of this amendment.

35 USC §102 Rejections

Claims 1-23 stand rejected under 35 USC §102(e) as allegedly anticipated by Ferguson. Applicants respectfully traverse this rejection with respect to pending claims 1, 2 and 4-23.

A proper rejection under 35 USC §102 requires that a single reference teach each and every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present. See M.P.E.P. §2131. Ferguson does not disclose each and every feature recited in claims 1-23.

Amended claim 1 is directed to a method of performing route lookups for a group of data including processing, by a processor, a first data to generate first routing information until first information is needed; requesting the first information; storing first context state information that includes a first partial result or a first process state for the first data; processing, by the processor, a second data before receiving the first information to generate second routing information until second information is needed; requesting the second information; storing second context state information that includes a second partial result or a second process state for the second data; and resuming processing, by the processor, on the first data before receiving the second information

using the stored first context state information after the requested first information is received.

Ferguson does not disclose or suggest each of these features.

For example, Ferguson does not disclose storing first context state information that includes a first partial result or a first process state for the first data, as required by amended claim 1. The Examiner alleges that this feature of claim 1 is taught by Ferguson at col. 4, lines 16-33 (Office Action, page 3).

Col. 4, lines 16-33 of Ferguson recites:

Aspects of the invention can include one or more of the following features. The lookup operation engines can be selected from the group of a tree search look up engine, an index search index engine and a filter engine. The route lookup engine can include a memory configurable to store one or more tree data structures and where the pointer returned for invoking the tree search engine includes an indicator pointing to a particular tree data structure stored in the memory to be searched in the lookup operation. The memory can include one or more index data structures and where the pointer returned for invoking the index search engine includes an indicator pointing to a particular index data structure stored in the memory to be searched in the lookup operation. The memory can store one or more filter data structures and where the pointer returned for invoking the filter engine includes an indicator pointing to a particular filter data structure stored in the memory to be searched in the lookup operation.

This portion of Ferguson, discusses types of lookup operation engines that can be selected from the group of a tree search look up engine, an index search index engine, and a filter engine. This portion of Ferguson, further discusses using a pointer to return information about a particular tree data structure stored in memory. Contrary to the Examiner's interpretation, this portion of Ferguson does not disclose or suggest storing first context state information that includes a first partial result or a first process state for the first data, as required by claim 1. In fact, Ferguson does not discuss the terms "context state," "partial result," or "process state" anywhere in the disclosure of Ferguson. For at least these reasons, Ferguson does not disclose or suggest this feature of claim 1. Moreover, Ferguson does not disclose or suggest other features of claim 1.

For example, Ferguson does not disclose or suggest processing, by the processor, a second data before receiving the first information to generate second routing information until second information is needed, or requesting the second information, as further required by claim 1. The Examiner alleges that these features of claim 1 are taught by Ferguson at col. 2, line 64 to col. 3, line 11 (Office Action, page 3).

Col 2, line 64 to col. 3, line 11 of Ferguson discloses:

In another aspect the invention provides a method for performing a lookup in a switching device. The method includes identifying a first lookup operation in a sequence of lookup operations to be performed on a packet, executing the first lookup operation including returning a result that is a pointer to a subsequent lookup operation in the sequence, executing the subsequent lookup including returning a result that is a pointer to a next lookup operation in the sequence, continuing to execute lookup operations in the sequence until a lookup operation in the sequence returns a result that indicates that no more operations are to be processed and when a result indicates that no more operations are to be processed, returning a notification to the switching device that includes routing information for the routing of the packet through the switching device.

This portion of Ferguson discloses sequentially performing a lookup operation and returning a result that is a pointer to a subsequent lookup operation and then returning a result that is a pointer to a next lookup operation. Col. 2, line 64 to col. 3, line 11, of Ferguson, is silent with respect to processing a second data before receiving the first information to generate second routing information until second information is needed, or requesting the second information, as further required by claim 1. Therefore, Ferguson does not teach or suggest these features of claim 1. Moreover, Ferguson does not disclose or suggest still other features of claim 1.

For example, Ferguson does not disclose or suggest resuming processing, by the processor, on the first data before receiving the second information using the stored first context state information after the requested first information is received, as further required by claim 1. The Examiner alleges that the above feature of claim 1 is disclosed by Ferguson at col. 4, lines

16-33 (Office Action, page 3). As previously discussed, col. 4, lines 16-33, of Ferguson, discloses types of lookup operation engines that can be selected from the group of a tree search look up engine, an index search index engine, and a filter engine and using a pointer to return information about a particular tree data structure stored in memory. Contrary to the Examiner's interpretation, col. 4, lines 16-33, of Ferguson, does not disclose or suggest resuming processing, by the processor, on the first data before receiving the second information using the stored first context state information after the requested first information is received, as required by claim 1.

Since Ferguson does not disclose the combination of features recited in claim 1, the 35 USC §102(e) rejection of claim 1 is improper. Applicants respectfully request that the rejection of claim 1 under 35 USC §102(e) based on Ferguson be reconsidered and withdrawn.

Claims 2, 4 and 5 depend from claim 1. Claim 3 has been canceled so the 35 USC §102(e) rejection of claim 3 is moot. Claims 2, 4, and 5 remain pending and are allowable for at least the reasons argued in connection with claim 1. Applicants respectfully request that the rejection of claims 2, 4 and 5 under 35 USC §102(e) based on Ferguson be reconsidered and withdrawn.

Amended claim 6 is directed to a method of processing for routing packets that includes providing state information to allow a processor to store intermediate information; processing a first data related to routing of a first packet until first information is needed; requesting the first information; storing intermediate information related to the first data; and processing a second data related to routing of a second packet while waiting for the requested first information to arrive. Ferguson does not disclose or suggest each of these features.

For example, Ferguson does not disclose or suggest providing state information to allow

a processor to store intermediate information, as required by claim 6. Ferguson is silent with respect to providing state information to allow a processor to store intermediate information. As a result, Ferguson does not disclose or suggest this feature of claim 6. Moreover, Ferguson does not disclose or suggest other features of claim 6.

For example, Ferguson does not disclose or suggest processing a second data related to routing of a second packet while waiting for the requested first information to arrive, as further required by claim 6. The Examiner alleges that this feature of claim 6 is disclosed by Ferguson at col. 2, line 64 to col. 3, line 11 (Office Action, page 4). As previously discussed in connection with claim 1, col. 2, line 64 to col. 3, line 11, of Ferguson, discloses sequentially performing a lookup operation and returning a result that is a pointer to a subsequent lookup operation and then returning a result that is a pointer to a next lookup operation. This portion of Ferguson does not address processing a second data related to routing of a second packet while waiting for the requested first information to arrive, as required by claim 6.

Since Ferguson does not disclose the combination of features recited in claim 6, the 35 USC §102(e) rejection of claim 6 is improper. Applicants respectfully request that the rejection of claim 6 under 35 USC §102(e) based on Ferguson be reconsidered and withdrawn.

Claims 7 and 8 depend from claim 6 and are allowable for at least the reasons argued in connection with claim 6. Applicants respectfully request that the rejection of claims 7 and 8 under 35 USC §102(e) based on Ferguson be reconsidered and withdrawn.

Amended claim 9 is directed to a method for routing packets of information using corresponding data structures that includes receiving a plurality of data structures related to the packets of information; sending the plurality data structures to a plurality of processing engines;

monitoring states of the plurality of processing engines to allow the plurality of processing engines to generate partial results based on processing the plurality of data structures; performing, at each processing engine, concurrent route lookups for at least two of the data structures at a time using partial results for the data structures; modifying the data structures based on the route lookups; and routing the packets of information based on the modified data structures. Ferguson does not disclose or suggest each of these features.

For example, Ferguson does not disclose or suggest monitoring states of the plurality of processing engines to allow the plurality of processing engines to generate partial results related to processing the plurality of data structures, as required by claim 9. Ferguson is silent with respect to monitoring states of a plurality of processing engines and the generation of partial results related to processing a plurality of data structures. For at least these reasons, Ferguson does not disclose or suggest monitoring states of the plurality of processing engines to allow the plurality of processing engines to generate partial results related to processing the plurality of data structures. Moreover, Ferguson does not disclose or suggest other features of claim 9.

For example, Ferguson does not disclose or suggest performing, at each processing engine, concurrent route lookups for at least two of the data structures at a time using partial results for the data structures, as further required by claim 9. The Examiner alleges that Ferguson discloses this feature of claim 9 at col. 12, lines 50-60 (Office Action, page 5).

Col. 12, lines 50-60, of Ferguson, discloses:

Referring now to FIG. 8, controller 106 includes controller memory 109, route lookup engine 110, input switch interface 800 and output switch interface 802. Controller 106 receives a route lookup request from input switch 100 at the input switch interface 800. In one implementation, a plurality of route lookup engines 110 are included in controller 106, each receiving lookup requests in round-robin fashion so as to speed the routing process. In one implementation, controller memory 109 is a four-bank static random

access memory (SRAM) that requires thirty six route lookup engines 110 to service at full bandwidth.

This portion of Ferguson discloses route lookup engines 110 that receive lookup requests in a round-robin fashion while operating in controller 106. Contrary to the Examiner's allegation, this portion of Ferguson is silent with respect to performing concurrent route lookups for at least two data structures at a time using partial results for the data structures. For at least these reasons, Ferguson does not disclose or suggest performing, at each processing engine, concurrent route lookups for at least two of the data structures at a time using partial results for the data structures, as required by claim 9.

Since Ferguson does not disclose the combination of features recited in claim 9, the 35 USC §102(e) rejection of claim 9 is improper. Applicants respectfully request that the rejection of claim 9 under 35 USC §102(e) based on Ferguson be reconsidered and withdrawn.

Claims 10-12 depend from claim 9 and are allowable for at least the reasons argued in connection with claim 9. Applicants respectfully request that the rejection of claims 10-12 under 35 USC §102(e) based on Ferguson be reconsidered and withdrawn.

Amended claim 13 is directed to a network device that includes an input portion configured to receive data structures and to transmit data items associated with the data structures; a group of processing engines, each processing engine configured to receive a group of data items from the input portion and contemporaneously compute routes for the group of data items, and wherein each processing engine includes a data processor configured to at least partially calculate a route for the data item based on a partial result, and a functional control state machine configured to control operation of the data processor by maintaining a processing state so that the data processor can calculate the route for the data item based on information from the

partially calculated route; a resource configured to receive requests from the group of processing engines; a result processor configured to modify the data structures based on the routes computed by the group of processing engines; and a memory to store processing states or the partially calculated route for at least one of the plurality of processing engines. Ferguson does not disclose or suggest each of these features.

For example, Ferguson does not disclose or suggest a plurality of processing engines, each processing engine configured to receive a plurality of data items from the input portion and contemporaneously compute routes for the plurality of data items, and wherein each processing engine includes a data processor configured to at least partially calculate a route for a data item based on a partial result, and a functional control state machine configured to control operation of the data processor by maintaining a processing state so that the data processor can calculate the route for the data item based on information from the partially calculated route, as required by claim 13. The Examiner alleges that these features of claim 13 are disclosed by Ferguson at Figure 9 and col. 14, lines 8-27 (Office Action, page 6). Figure 9 discloses a schematic block diagram for a key lookup engine (col. 5, lines 41-42).

Col. 14, lines 8-27, of Ferguson, recites:

Referring now to FIG. 9, each route lookup engine 110 includes a key buffer 902, a result buffer 904, a key engine 905, one or more specialized engines for processing packets 906, a current key pointer 908 and starting hop table 910. In one implementation, each route lookup engine 10 includes a general purpose key engine 905 and plural specialized engines 906. The general purpose key engine 905 receives the key from the input switch, loads the key and result buffers, performs initializations, unloads the buffers and performs other operations in support of the lookup process. Specialized engines operate on instructions or data structures stored in memory 920 to perform a particular function. Functions can be selected from lookup operations, filtering, policing, management or other functions. In one implementation, the specialized engines can be selected from the group of a firewall engine 906a, a policing engine 906b, index engine 906c and trie search engine 906d. Each of these engines can be invoked to perform an operation and

assist in determining a forwarding decision for a packet. As will be described below, more than one engine can be invoked to operate on each packet.

Col. 14, lines 8-27, of Ferguson, discloses components included in a route lookup engine 110 that can be used to perform lookup operations, filtering, policing, management or other functions. This portion of Ferguson does not disclose or suggest partially calculating a route, partial results, or a functional control state machine, as required by claim 13. Therefore, contrary to the Examiner's allegation, Figure 9 and col. 14, lines 8-27, of Ferguson, do not disclose or suggest a processor configured to at least partially calculate a route using a partial result or a functional control state machine configured to control operation of the data processor by maintaining a processing state, as required by claim 13. For at least these reasons, Ferguson does not disclose or suggest a group of processing engines where each processing engine includes a data processor configured to at least partially calculate a route for a data item based on a partial result, and a functional control state machine configured to control operation of the data processor by maintaining a processing state so that the data processor can calculate the route for the data item based on information from the partially calculated route.

Since Ferguson does not disclose the combination of features recited in claim 13, the 35 USC §102(e) rejection of claim 13 is improper. Applicants respectfully request that the rejection of claim 13 under 35 USC §102(e) based on Ferguson be reconsidered and withdrawn.

Claims 14-18 depend from claim 13 and are allowable for at least the reasons argued in connection with claim 13. Applicants respectfully request that the rejection of claims 14-18 under 35 USC §102(e) based on Ferguson be reconsidered and withdrawn.

Amended claim 19 recites a system for performing concurrent route lookups for processing a group of data items that includes a data processing portion configured to process

one data item at a time and to pipeline data requests to substantially eliminate idle time of the data processing portion; a control state portion to monitor operation of the data processing portion by receiving state information related to a partial result produced by the data processing portion; a buffer configured to store the partial result; and a controller configured to load the partial result from the data processing portion into the buffer and to input the another data item into the data processing portion for processing while requested data is obtained for a prior data item. Ferguson does not disclose or suggest each of these features.

For example, Ferguson does not disclose or suggest a data processing portion configured to process one data item at a time and to pipeline data requests to substantially eliminate idle time of the data processing portion, as required by claim 19. The Examiner alleges that col. 2, line 64 to col. 3, line 11, of Ferguson, discloses this feature of claim 19 (Office Action, page 7). Applicants disagree. As discussed in connection with claim 1, above, col. 2, line 64 to col. 3, line 11 discloses sequentially performing a lookup operation and returning a result that is a pointer to a subsequent lookup operation and then returning a result that is a pointer to a next lookup operation. Contrary to the Examiner's interpretation, this portion of Ferguson does not disclose or suggest a data processing portion configured to process one data item at a time and to pipeline data requests to substantially eliminate idle time of the data processing portion. Moreover, Ferguson fails to disclose or suggest other features of claim 19.

For example, Ferguson does not disclose or suggest a control state portion to monitor operation of the data processing portion by receiving state information related to a partial result produced by the data processing portion, as further required by claim 19. For at least these reasons, Ferguson fails to disclose or suggest the features of claim 19.

Since Ferguson does not disclose the combination of features recited in claim 19, the 35 USC §102(e) rejection of claim 19 is improper. Applicants respectfully request that the rejection of claim 19 under 35 USC §102(e) based on Ferguson be reconsidered and withdrawn.

Claims 20-22 depend from claim 19 and are allowable for at least the reasons argued in connection with claim 19. Applicants respectfully request that the rejection of claims 20-22 under 35 USC §102(e) based on Ferguson be reconsidered and withdrawn.

Amended claim 23 recites a system that includes means for processing data structures to generate routing information and for requesting information; means for monitoring operation of the means for processing via state information associated with partial results produced by the means for processing when generating the routing information; means for storing the partial results from the means for processing while waiting for the requested information; and means for loading the partial results into the means for storing and loading a data structure into the means for processing when the means for processing requests the information, and for loading the partial results into the means for processing after the requested information arrives. Ferguson does not disclose or suggest each of these features.

For example, Ferguson does not disclose or suggest means for monitoring operation of the means for processing via state information associated with partial results produced by the means for processing when generating the routing information, as required by claim 23. As previously discussed, Ferguson is silent with respect to “state information,” or “partial results.” Therefore, Ferguson does not disclose or suggest means for monitoring operation of the means for processing via state information associated with partial results produced by the means for processing when generating the routing information.

Since Ferguson does not disclose the combination of features recited in claim 23, the 35 USC §102(e) rejection of claim 23 is improper. Applicants respectfully request that the rejection of claim 23 under 35 USC §102(e) based on Ferguson be reconsidered and withdrawn.

CONCLUSION

In view of the foregoing amendments and remarks, Applicants respectfully request the Examiner's reconsideration of this application, and the timely allowance of the pending claims. Applicants respectfully request that the present amendment be entered because the present amendment places the application in immediate condition for allowance.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-1070 and please credit any excess fees to such deposit account.

Respectfully submitted,

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